

WHAT IS CLAIMED IS:

1. A filter module for aircraft lubrication systems comprising a housing containing a filter inlet and a discharge outlet, a filter chamber within said housing, a filter assembly removably attachable to said filter chamber, a shut-off valve within said housing which is moved to an open position providing fluid communication between said inlet and said outlet through said filter chamber when said filter assembly is inserted into said filter chamber, a spring for moving said shut-off valve to a closed position blocking fluid communication between said inlet and said filter chamber when said filter assembly is removed from said filter chamber, and a bypass valve within said housing for providing fluid communication between said inlet and said outlet whenever a differential pressure across said bypass valve reaches a predetermined high level.

2. The filter module of claim 1 wherein said shut-off valve is moved into the closed position by said spring before said filter assembly is completely removed from said filter chamber.

3. The filter module of claim 1 wherein said filter assembly is threadedly connectable to said filter chamber.

4. The filter module of claim 1 wherein said filter assembly comprises a filter cover containing a filter element having an end cap at one end that is engageable with said shut-off valve during insertion of said filter assembly into said filter chamber to cause said shut-off valve to move to the open position.

5. The filter module of claim 4 wherein said shut-off valve has a central passage providing fluid communication between said outlet and said filter chamber through said shut-off valve.

6. The filter module of claim 5 wherein said end cap includes a central hub portion in sealed engagement with a tubular extension on said shut-off valve when said filter assembly is attached to said filter chamber.

5 7. The filter module of claim 6 wherein said bypass valve is axially movable into and out of sealed engagement with a valve seat in said housing.

10 8. The filter module of claim 7 wherein said spring that biases said shut-off valve toward the closed position also biases said bypass valve into sealed engagement with said valve seat.

15 9. The filter module of claim 8 further comprising a bypass passage in said housing for providing fluid communication between said inlet and said outlet through said bypass valve when the differential pressure acting on said bypass valve reaches a predetermined high level causing said bypass valve to move out of engagement with said valve seat.

20 10. The filter module of claim 1 wherein said filter assembly comprises a filter cover containing a removable filter element and said filter chamber is formed by an internally threaded bore in said housing in which an externally threaded open end of said filter cover is threadedly connectable.

25 11. The filter module of claim 1 wherein said filter assembly includes a drain plug which is removable to allow drain down of fluid through said inlet without having to remove said filter assembly from said filter chamber.

30 12. The filter module of claim 1 wherein said filter assembly has a closed outer end, further comprising a visual impending bypass indicator mounted in a sealed opening in said closed outer end for providing a visual indication that said filter assembly needs to be cleaned or replaced.

5 13. The filter module of claim 12 wherein said visual indicator includes a button that pops out beyond the closed outer end of said filter assembly when the pressure across said filter element reaches a predetermined high level providing a visual indication that the filter assembly needs to be cleaned or replaced.

10 14. The filter module of claim 1 which comprises a single line
replaceable filter module in an aircraft lubrication filtration system.

15 15. The filter module of claim 1 wherein said shut-off valve is closed prior to disengagement of said filter assembly from said filter chamber to prevent drain down of a lube tank attached to said inlet during filter assembly removal.

20 16. The filter module of claim 15 further comprising a discharge check valve in said housing for preventing drain down of a discharge line connected to said outlet during filter assembly removal.

25 17. The filter module of claim 1 further comprising a pump chamber in said housing and a pumping element in said pumping chamber for pumping fluid from a pump inlet to said filter inlet.

30 18. The filter module of claim 17 further comprising a lubrication return line in fluid communication with said filter inlet.

25 19. A filter module for aircraft lubrication systems comprising a housing having a filter inlet and a discharge outlet, a filter chamber, a filter assembly removably attachable to said filter chamber, a shut-off valve within said housing which is moved to an open position providing fluid communication between said inlet and said outlet through said filter assembly when said filter assembly is inserted into said filter chamber, a spring for maintaining said shut-off valve in a closed position blocking fluid communication between said inlet and said filter

chamber when said filter assembly is removed from said filter chamber, and a bypass valve within said housing for providing bypass flow from said inlet to said outlet through said bypass valve whenever a differential pressure across said bypass valve reaches a predetermined high level, said inlet and said outlet being connectable to respective inlet and discharge lines of an aircraft lubrication system to provide a single line replaceable unit.

20. A lubrication and scavenge pump assembly comprising a housing containing a pump chamber, a pumping element in said pump chamber for pumping fluid from a pump inlet to a filter inlet within said housing, a filter chamber in said housing, a filter assembly removably attachable to said filter chamber, a shut-off valve in said housing which is moved to an open position providing fluid communication between said filter inlet and a discharge outlet in said housing through said filter assembly when said filter assembly is inserted into said filter chamber, a spring for maintaining said shut-off valve in a closed position blocking fluid communication between said filter inlet and said filter chamber when said filter assembly is removed from said filter chamber, and a bypass valve within said housing for providing fluid communication between said filter inlet and said discharge outlet through said bypass valve whenever a differential pressure across said bypass valve reaches a predetermined high level.

21. The pump assembly of claim 20 further comprising a lubrication return line in fluid communication with said filter inlet.